(54) Title: ROUTING BETWEEN COMMUNICATION NETWORKS
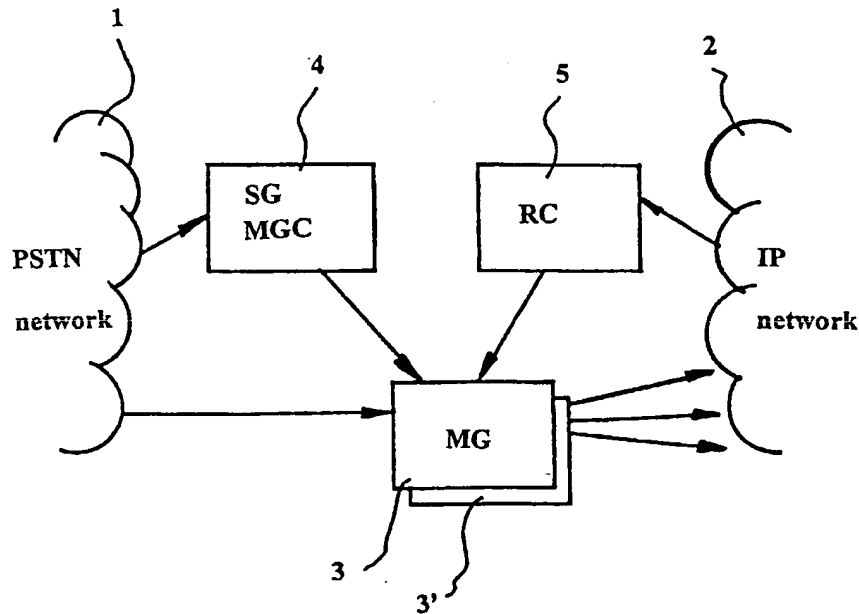
(57) Abstract

The present invention relates to a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network. In the method all routing procedures for the call are handled by a separate routing controller common for several media gateways. The invention relates further to an arrangement for performing the same.

ROUTING BETWEEN COMMUNICATION NETWORKS .

FIELD OF THE INVENTION

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The present invention relates to a method of routing in
telecommunication networks, and more precisely to a method
of routing between a telephone network and a data network.
The invention relates further to an arrangement for
10   performing the routing operations between two different
networks.

BACKGROUND OF THE INVENTION

15   An interfacing gateway or access node is required in the
communication path or route between two different
communication networks. For instance, an interfacing access
node is required in cases where the other network is a
telephone network, such as a Public Switched Telephone
20   Network (PSTN) and the other network is a data network, such
as a packet switched data network (PSDN). Examples of the
packet switched networks include the global connectionless
Internet utilising TCP/IP (Transport Control
Protocol/Internet Protocol) protocol suite and various
25.   Intranet applications.

One possibility to implement the access node AN between the
PSTN and the packet switched data network is a routing
device referred to as Network Access Server (NAS). NAS can
30   be defined as a device which receives calls from the PSTN
and translates the calls into Internet IP packet form.

At least some degree of routing functionality is required in
the communication network system for the transmission of the
35   data packets over the data network in order to be able to

sent the data packets to a correct next router and finally
to a correct destination address. This functionality is
usually integrated to the NAS, or then all traffic goes
through a separate router especially and solely arranged to
5 accomplish the routing tasks. Routing protocols based on
international agreements are used in order to be able to
provide this functionality. The routing protocols are used
to adapt dynamically to the variations in networks
structures and also to the possible failures occurring
10 during various stages of transmission of the data packets.

SUMMARY OF THE INVENTION

The routing protocols, like OSPF (Open Shortest Path First)
15 and BGP (Border Gateway Protocol), are substantially complex
and do not suit especially well to simple network elements
the NAS otherwise would utilise. Thus the integration of the
routing protocols to each NAS unit of the network system is
in most cases an excessively complex task, and requires
20 otherwise unnecessary modifications and/or additional
hardware and/or software implementations to each of the
access servers in the system.

In case separate routers are used the routing causes one
25 extra step, and every packet has to be handled still once in
the NAS. This may cause delays in the traffic and increases
the risk for failures.

The current development is leading towards a model in which
30 the PSTN network control is separated from the NAS to a
signalling gateway (SG; SS7 to ISUP over IP conversion) and
Media Gateway Controller (MGC) handling the PSTN call
related control, whereby NAS remains only as a simple Media
Gateway (MG). A MG typically contains only one generic DSP
35 (Digital Signal Processor) that can be programmed

dynamically to form a modem or a voice over IP codec. This simplifies the structure of the MG (i.e. the access node for media) a lot, but does not solve the routing problem.

5   It is an object of the present invention to overcome the disadvantages of the prior art solutions and to provide a new type of solution for routing calls between different networks.

10   Another object of the present invention is to provide a method and arrangement by means of which the structure of the access node can be made less complex and unnecessary double processing of the data packets can be avoided.

15   According to a first aspect, the objects are obtained by a method of routing a call between a circuit switched network and a packet switched network in a network system comprising a media gateway between the circuit switched network and the packet switched network, wherein routing procedures for the

20   call are handled by a separate routing controller common for several media gateways.

The routing controller can give routing information to an appropriate media gateway concerning the destination of the

25   call traffic. The routing information may comprise the IP interface to be used and the IP address of the next router in the packet switched network. The routing controller for the packet switched network and signalling controller for the circuit switched network may also form a symmetric

30   structure relative to the media gateway. The call can originate both from the circuit switched network side and the packet switched network side.

According to another aspect the invention provides an

35   arrangement in a communication network system comprising: a

circuit switched network; a packet switched network; a
plurality of media gateways between the networks; a
signalling controller for handling circuit switched traffic;
and a separate routing controller for handling packet

5   switched traffic routing, said separate routing controller
being common to said plurality of media gateways.

The routing controller and the signalling controller can
form a symmetric structure relative to the media gateway.

10   The plurality of media gateways can also be arranged in a
stack.

According to a further aspect the invention provides a
routing controller for a communication network system

15   comprising a circuit switched network, a packet switched
network, a plurality of media gateways between the networks,
and a signalling controller for handling circuit switched
traffic, wherein the routing controller is arranged to form
a separate routing controller for handling packet switched

20   traffic routing such that said separate routing controller
is common to said plurality of media gateways.

Several advantages are obtained by means of the present
invention, since the solution provides a simplified

25   structure for the media gateway between different
communications networks. Since the required media gateway
apparatus is less complex than in the prior art solutions,
it is thus economically more advantageous and also more
reliable in use and less vulnerable for hardware and/or

30   software failures. The proposed solution does not have any
disadvantageous effects in the performance or functionality
of the system since the traffic is separated to different
outgoing interfaces. The proposed system adapts well to any
dynamic changes in the network system. In addition, by means

35   of the invention it becomes more easy to stack media gateway

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units to a tight space.

In the following the present invention and the other objects
and advantages thereof will be described in an exemplifying
5   manner with reference to the annexed drawings, in which
similar reference characters throughout the various figures
refer to similar features.

BRIEF DESCRIPTION OF THE DRAWINGS
10

Figure 1 is a schematic presentation of network system
including a telephone network and a data network and linking
apparatus there between; and
Figure 2 discloses signalling flow according to one
15   embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematical presentation of one network system
20   including a PSTN 1, IP network 2 (e.g. the TCP/IP Internet
or an intranet application) and an access node or a gateway
apparatus therebetween. The arrows indicate the signalling
directions in situation where a call has been initiated by a
terminal of the PSTN (not shown). In this example the
25   gateway apparatus comprises a plurality of media gateways 3,
3', a signalling gateway SG (for SS7 to ISUP over IP
conversion) and media gateway controller MGC handling call
related control 4.

30   Each MG 3,3' may contain only one generic DSP (Digital
Signal Processor) which can be programmed dynamically to
form a modem or a voice over IP codec. Thus the structure of
the MG can be made substantially simple, which reduces
remarkably the costs of the MG and also increases the
35   reliability of the MG. As disclosed, the MGs can be stacked

in a substantially tight space in a manner similar to
ordinary telephone exchanges. It is noted that even though
figure 1 discloses only two MGs, the number of them could be
substantially higher.

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The gateway apparatus is further provided with a separate
routing controller RC 5, the arrangement being such that the
routing is separated similarly to the signalling gateway and
media gateway controller 4 to the routing controller 5. In

10 other words, the system is "symmetric" relative to the MGs in
view of the PSTN and the IP network. Thus the former access
servers are now simplified to form only media gateway units
3,3'.

15 In a manner similar to the SG+MGC unit 4, the routing
controller unit 5 is common for several media gateway units
3,3'. The routing controller 5 is arranged to communicate to
the IP network 2 by using appropriate routing protocols,
such as the OSPF and the BGP, and to give required routing

20 orders to the particular media gateway unit 3 or 3'. The
main information required by the particular media gateway is
the current situation concerning the destination of the
traffic originating in the PSTN side and coming via a
certain PSTN line. The required information typically

25 consists of indication of correct IP interface which should
be used and the IP address of the next router (i.e. the next
"hop" in the data network).

An example of the routing protocols is the OSPF routing
30 protocol (RFC2178) which is one of the IP protocols, more
precisely IP protocol number 89. All those IP packets that
are coming to the media gateway MG and are of protocol 89
are tunnelled to the routing controller RC. The routing
controller 5 sees all MG interfaces as its own interfaces,
35 and when something is sent to a RC interface, it is

tunnelled to the MG and sent there. There are 5 types of
OSPF packets and they all must fit in to an IP packet of
size of 576 bytes (in case operated according to RFC2178
appendix A). Another typical protocol is RIP (RFC1723) that
5   is a UDP based protocol (a transport level datagram layer
above the IP layer, port 520). A similar tunnelling approach
works in this as well when the traffic from UDP port 520 is
forwarded to the routing controller.

10 The media gateway MG unit can be made as simple as possible
by removing both IP routing handling and call control from
it. This does not affect negatively to the performance or
the functionality of the system because the traffic is
separated to different outgoing ("egress") interfaces in a
15 manner similar to a router. The system also adapts to any
dynamic changes in the network in a manner similar to a
router.

The PSTN users often have a dynamically assigned IP address.
20 In this case the RC must "advertise" (i.e. announce) these
addresses so that the other routers of the system are
enabled to transmit the data packets to a correct MG.

It is also possible for an PSTN user to have a known IP
25 network address or a subnet of an IP network. In this case
the RC can call back to the PSTN telephone number associated
with this IP address when somebody tries to reach said IP
address from the IP network side. In case the connection has
already been setup, this case will be like the one already
30 discussed above.

The RC advertises routes to the fixed network addresses even
in instances where the connections are down i.e.
disconnected. The RC can accomplish this by using one, some
35 or available ports based on local policy (for instance, some

MGs may be closer to the destination in the PSTN). When a
packet addressed to a predefined destination arrives, the MG
routes it to a special dynamic interface that makes the SG
to set-up the requested telephone call. This may involve

5   utilisation of one additional server, e.g. an AAA server
(Authentication, Authorisation and Accounting server; most
often used protocol for an AAA server being RADIUS) that
maintains customer information in a database which is common
for the SC and the RC.

10

Figure 2 discloses signalling flows 11 to 13 (numbers in
circles) for the above described solution. At flow step 11
the AAA server 7 defines fixed routes and the RC 5 controls
that the MG 3 becomes advertised of the addresses and sets

15 up the MG 3 to start a connection should a data packet
arrive. In flow step 12 a data packet arrives, whereafter
the MG 3 contacts SG/MGC 4 in order to establish a
connection. SG 4 ask for a telephone number from the AAA
server 7 and establishes the connection to that number. Then

20 the MG 3 forwards the data packet to the established
connection 13. In case the same route is advertised in many
MGs, it must in most cases be ensured that only one
connection is established at the same time. However, there
may be instances where it could be desirable to establish

25. several connections, e.g. such that the user can receive
several calls at the same time and/or that the bandwidth is
increased by this and/or that the call may go to many
geographical locations at the same time.

30 Thus the invention provides an apparatus and a method by
which a significant improvement can be achieved in the area
of routing between different networks. It should be noted
that the foregoing exemplifying embodiments of the invention
are not intended to restrict the scope of the invention to

35 the specific forms presented above but the present invention

is meant rather to cover all modifications, similarities and
alternatives which are included in the spirit and scope of
the present invention, as defined by the appended claims.

Claims

1. A method of routing a call between a circuit switched
network and a packet switched network in a network system
comprising a media gateway between the circuit switched
network and the packet switched network, wherein routing
procedures for the call are handled by a separate routing
controller common for several media gateways.

2. A method in accordance with claim 1, wherein the routing
controller gives routing information to an appropriate media
gateway concerning the destination of the call traffic.

3. A method in accordance with claim 2, wherein the routing
information comprises the IP interface to be used and the IP
address of the next router in the packet switched network.

4. A method in accordance with any of the preceding claims,
wherein the routing controller for the packet switched
network and signalling controller for the circuit switched
network form a symmetric structure relative to the media
gateway.

5. A method in accordance with any of the preceding claims,
wherein the call comes to the media gateway from the circuit
switched network side.

6. A method in accordance with any of claims 1 to 4,
wherein the call comes to the media gateway from the packet
switched network side and is destined to a terminal
connected to the circuit switched network.

7. A method in accordance with claim 6, wherein, in case
the terminal has a dynamically assigned IP address, the IP

address of the terminal is advertised by the routing controller to routers of the system.

8. A method in accordance with claim 6, wherein, in case the terminal has a known IP address, the routing controller calls back to a called circuit switched terminal number associated with said IP address.

9. An arrangement in a communication network system comprising:

a circuit switched network;

a packet switched network;

a plurality of media gateways between the networks;

a signalling controller for handling circuit switched traffic; and

a separate routing controller for handling packet switched traffic routing, said separate routing controller being common to said plurality of media gateways.

10. An arrangement in accordance with claim 9, wherein the routing controller and the signalling controller form a symmetric structure relative to the media gateway.

11. An arrangement in accordance with claim 9 or 10, wherein the plurality of media gateways is arranged in a stack.

12. A routing controller for a communication network system comprising a circuit switched network, a packet switched network, a plurality of media gateways between the networks, and a signalling controller for handling circuit switched traffic, wherein the routing controller is arranged to form a separate routing controller for handling packet switched traffic routing such that said separate routing controller is common to said plurality of media gateways.
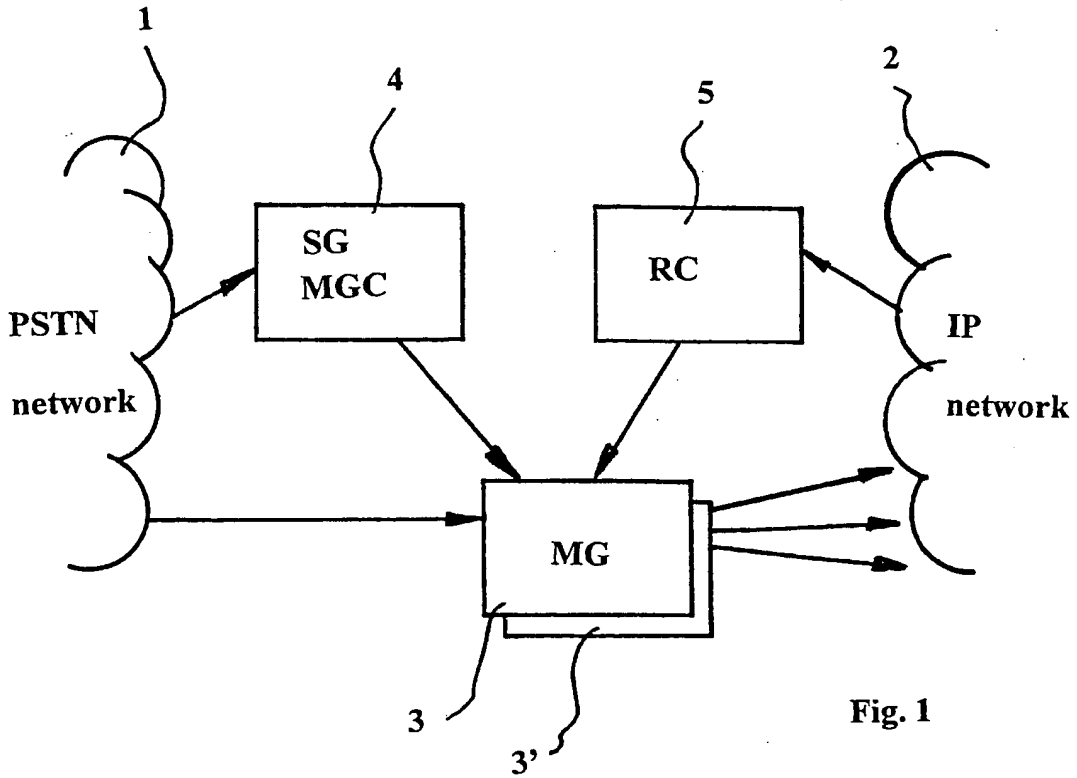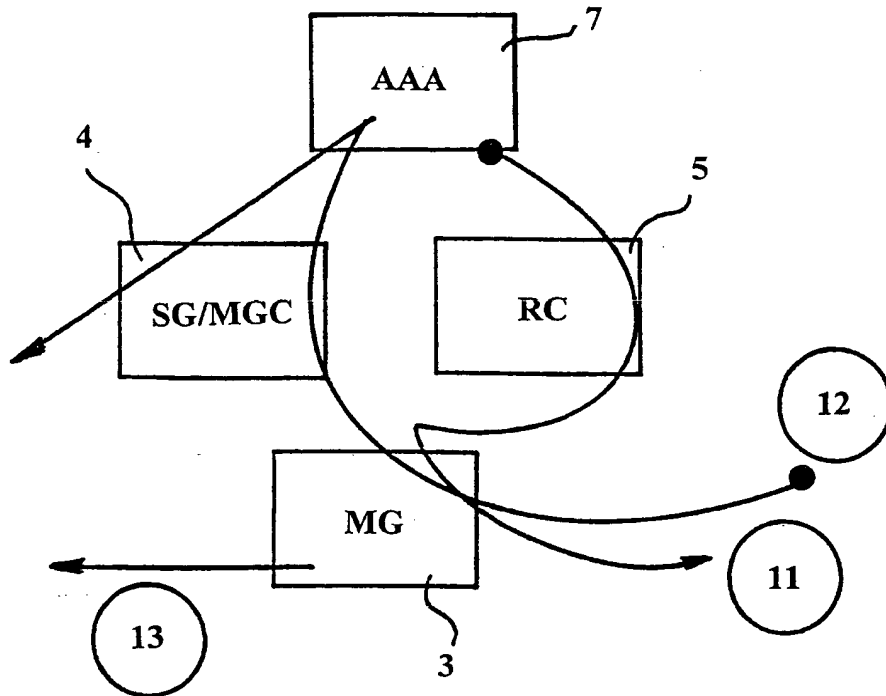
Fig. 1

Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No
PC., FI 00/00324

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7   H04L12/56   H04L12/66   H04L12/46   H04Q11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7   H04L   H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	---	7
X	EP 0 880 255 A (NORTHERN TELECOM LTD) 25 November 1998 (1998-11-25) column 4, line 3 - line 47 column 6, line 37 - line 57 column 8, line 45 -column 9, line 5 column 9, line 25 - line 43; figure 1 --- -/--	1-6,8-11

[X] Further documents are listed in the continuation of box C.   [X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 July 2000	2 8. 08. 2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	M. Eddin/EE

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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P,X	WO 99 62242 A (3COM CORP) 2 December 1999 (1999-12-02) page 2, line 1 - line 28 page 4, line 1 - line 24 page 5, line 10 - line 32 page 6, line 5 - line 29 page 7, line 12 - line 22; figures 3A-3C abstract	1-6,8-12
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